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**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Application Number: 10/523,650
Filing Date: February 04, 2005
Appellant(s): CAVAGLIA, GIULIANO

Richard E. Fichter__________________
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 04/02/2010 appealing from the Office action mailed 09/03/2009

(1) Real Party in Interest

The examiner has no comment on the statement, or lack of statement, identifying by name the real party in interest in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The following is a list of claims that are rejected and pending in the application:

56, 59-63, 84-107, 109-113, 117and 118.

Claims 114-116 are objected to and not subject of the Appleal Brief.

(4) Status of Amendments After Final

The examiner has no comment on the appellant's statement of the status of amendments after final rejection contained in the brief.

(5) Summary of Claimed Subject Matter

The examiner has no comment on the summary of claimed subject matter contained in the brief.

(6) Grounds of Rejection to be Reviewed on Appeal

The examiner has no comment on the appellant's statement of the grounds of rejection to be reviewed on appeal. Every ground of rejection set forth in the Office action from which the appeal is taken (as modified by any advisory actions) is being maintained by the examiner except for the grounds of rejection (if any) listed under the subheading "WITHDRAWN REJECTIONS." New grounds of rejection (if any) are provided under the subheading "NEW GROUNDS OF REJECTION."

(7) Claims Appendix

The examiner has no comment on the copy of the appealed claims contained in the Appendix to the appellant's brief.

(8) Evidence Relied Upon

5362844	**Kerpes et al**	**11-1994**
5409983	**Jones et al**	**4-1995**
3075952	**Coover et al**	**1-1963**
5449701	**Duh**	**9-1995**
4849497	**Scannapieco**	**7-1989**
4644049	**Tung et al**	**2-1987**

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Issue I

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 56, 59-63, 84-92, 95, 100-107, 109-112, 118 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kerpes et al (US 5362844) herein Kerpes in

view of Coover et al (US patent 3075952) herein Coover and evidences by Jones (US patent 5409983) herein Jones .

Kerpes discloses a solid phase continuous process for PET production for bottles (meeting the limitations of new claim 118, modified with IPA (meeting the limitations of claims 89-90, see Example 1) ,

comprising the steps of:

preparing a mass of polyester prepolymer granules, comprising at least one polyester (see Example 1, particularly palletizing step);

feeding said polyester prepolymer granules with intrinsic viscosity within the range of 06-068 dl/g (meeting the limitations of claims 90-91, see Table 1) to a crystallizer and heating them to a temperature of about 185°C to about 189°C to cause the crystallization of the granules (see Table 1, crystallization step and Column 2, line 45) (meeting the limitations of claims 59-60);

(Since Kerpes's and Application's conditions of crystallization are nearly identical, Kerpes's polyester has the same range of crystallization degree as one of the Application, meeting the limitations of Claims 61-63. Regarding Claim 103, since Kerpes uses the same temperature range for crystallization, residence time of 20 minutes is sufficient for crystallization.)

feeding crystallized granules into a reactor, producing a purge gas flow inside said first reactor to increase the intrinsic viscosity of said at least one polyester (see claim 1, limitation (f), "dealdehydization step at 175-225C, with purge of dry CO2, N2 or CO2 and their mixtures (meeting the limitations of claims 84-88),where intrinsic viscosity increases on 0.1 dl/g (see Table 1).

Kerpes teaches that dew point of his dried gas is below -20C (see Column 4, line 45). However, use of the dried gas, which has a dew point below -30C is well known in the art. As evidenced by Jones, dried gas can have a dew temperature below -60C (see Example 1). (Note that Jones teaches dried air. However, it is obvious to an artisan to use an inert gas in order to exclude oxidation of the final product).

It would have been obvious to a person of ordinary skills in the art to use dried gas with dew point below -30C, since it accelerates the reaction, decreasing the residence time, which results in more economically sound process.

In reference to Claim 90, Kerpes teaches PET modified with 2.5% of Isophthalic acid (see Examples 1 to 3).

In reference to Claim 95, Carboxylic end group content depends on Molecular weight of polymer. Since Kerpes discloses the same range of molecular weights, the content of end acidic groups is in the range of 10-45%.

Regarding new claim 117, Kerpes does not teach particular value for crystallization degree. However, the particle size and polymer IV and crystallization parameters are at the same range as one of the Application. Therefore, crystallization degree in both cases is expected to be at the same range. (Note that sufficiently crystallized PET particles are not sticky, while SSP for excessively crystallized material is more difficult, due to low diffusion of the rigid particles. Therefore, it is always important for an artisan to keep crystallization degree at optimum level).

Kerpes does not teach reactor design.

In particular, Kerpes does not teach post-crystallization process in an horizontal, cylindrical rotary reactor, which is being slightly inclined.

Note, however, that any reactor can be considered as “slightly inclined”, since ideal horizontal position is not achievable. Applicant supports the limitation above in Specification (see line 0049), disclosing 0.1-12 Degree angle slope. However, slope of 0.1 Degree practically means horizontal reactor, since this angle is within the measurement error.

Coover discloses a solid state polymerization in slightly inclined rotary reactor.

Coover discloses a process for the solid phase continuous polymerization of polyesters, comprising the following steps:

Preparing a mass polyester prepolymer particles, comprising at least one polyester (see Examples 1A and 1B).

feeding crystallized particles at a temperature within the range 170 °C - 300°C (Column 2, line 25) into an horizontal, cylindrical, rotary reactor, which is being slightly inclined (Column 4, line 20 and Column 5, line 15) downwardly from a feeding end (Column 5, line 15); producing a purge gas flow inside said reactor (Column 2, line 25), which fluidize the particles; causing the intrinsic viscosity (IV) of polyester to increase typically on 0.4 units (column 5, line 35).

Regarding reactor design, Coover teaches that the tube can be designed so that the particles of prepolymer can remain in the reactor for the required period of time, while the tube is being rotated and moving the particles downwardly according to the degree of slope of the tube. By using of such a rotating tube apparatus the particles of the polymer with substantially uniform intrinsic viscosity and relatively narrow molecular weight distribution is formed (see Column 5, line 25).

Use of horizontal, cylindrical, rotary reactor, which is being slightly inclined is beneficial, since it creates such reaction environment which allow more effective removal of water and aldehydes, producing uniform intrinsic viscosity polymer with narrow molecular weight distribution.

Therefore, it would have been obvious to a person of ordinary skills in the art to use horizontal, cylindrical, rotary reactor in Kerpes's process, since this reactor design allows better removal of water vapors and aldehydes, producing uniform intrinsic viscosity polymer with narrow molecular weight distribution.

Regarding claims 109-111 relates to a process design (i.e. speed of reactor rotation and degree of reactor tilting). The position is taken that the above technological parameters can be adjusted by an artisan depending on the features of the specific process. The position is taken that an operator should organize process in such a way to provide optimal mixing of the granules in order to remove water vapors and aldehydes in most efficient manner. Therefore, rate of purging gas, rotation speed and tilting angle and other related parameters should be optimized with routine experimentation.

Regarding claim 112, Coover teaches bed thickness 1-25% compare to reactor diameter (see Column 6, line 1), which is clearly below 4-5 m.

Regarding claim 113, since Coover's reactor has the same design as one of the Application examined, the same granules behavior inside the reactor is expected.

Issue II

Claims 93-94 rejected under 35 U.S.C. 103(a) as being unpatentable over Kerpes in view of Coover and further view of Tung et al (US 4644049) herein Tung.

Kerpes discloses a solid phase continuous process for PET production, modified with IPA (meeting the limitations of claims 89-90, see Example 1),

comprising the steps of:

preparing a mass of polyester prepolymer granules, comprising at least one polyester (see Example 1, particularly palletizing step);

feeding said polyester prepolymer granules with intrinsic viscosity within the range of 06-068 dl/g (meeting the limitations of claims 90-91, see Table 1) to a crystallizer and heating them to a temperature of about 185°C to about 189°C to cause the crystallization of the granules (see Table 1, crystallization step and Column 2, line 45) (meeting the limitations of claims 59-60);

Coover discloses a process for the solid phase continuous polymerization of polyesters, comprising the following steps:

Preparing a mass polyester prepolymer particles, comprising at least one polyester (see Examples 1A and 1B).

feeding crystallized particles at a temperature within the range 170 °C - 300°C (Column 2, line 25) into an horizontal, cylindrical, rotary reactor, which is being slightly inclined (Column4, line 20 and Column 5, line 15) downwardly from a feeding end (Column 5, line 15); producing a purge gas flow inside said reactor (Column 2, line 25),

which fluidize the particles; causing the intrinsic viscosity (IV) of polyester to increase typically on 0.4 units (column 5, line 35).

Coover and Kerpes both disclose a process for the solid phase continuous polymerization of Polyethylene terephthalate.

Coover and Kerpes do not teach a solid state polymerization process for Polybutylene terephthalate and Polyethylene naphthalate.

However, solid state polymerization process for the above polymers is well known in the art.

Tung discloses such a process for Polybutylene terephthalate (PBT) (see Column 2, line 20) and Polyethylene naphthalate (PEN) (see Claim 3). Processes for production of PET, PBT and PEN share the same common features. The only difference is that the artisan should adjust technological parameters depending on the type of the polymer and its grade.

Therefore, it would have been obvious to a person of ordinary skills in the art to apply Coover/Kerpes process to Polybutylene terephthalate and Polyethylene naphthalate in order to increase diversity and applicability of the process.

Issue III

Claims 93, 96-100 rejected under 35 U.S.C. 103(a) as being unpatentable over Kerpes in view of Coover and further view of Duh et al (US patent 5449701) herein Duh.

Coover and Kerpes disclose the solid-state polymerization of polyesters (see discussion above).

Coover and Kerpes do not teach the shapes of the particles.

Duh discloses a solid-state polymerization for polyethylene naphthalate. He teaches that feeding prepolymer typically contains solid granules in the shape of pellets, spheres, chips or cubes. Those shapes are advantageous since the formation of undesirable very high molecular weight fraction is reduced (column 1, line 20).

Duh teaches that although at smaller particle size the reaction is more effective due to better diffusion, very small particles has a tendency to stickiness. Therefore there is a limitation for minimal particle size in solid state polymerization (column 1, line 30).

In addition, shape of the particles may play an important role in diffusion processes.

Therefore, it would have been obvious to a person of ordinary skills in the art that particle size and shape (i.e. surface area at given mass) is the most important factor for diffusion of water from the particles. At high surface area equilibrium of post

polymerization reaction shifts to molecular weight increase, which makes a process more efficient.

Issue IV

Claim 95 rejected under 35 U.S.C. 103(a) as being unpatentable over in Kerpes view of Coover and further view of Scannapieco (US 4849497) herein Scannapieco.

Coover and Kerpes disclose a process for the solid phase continuous polymerization of polyesters (see discussion above).

Coover and Kerpes do not disclose that carboxyl end group content should be within the range of 10-45%.

Scannapieco discloses a process for the solid phase continuous polymerization of polyesters.

Scannapieco teaches that carboxyl end group content should be less than 30% in order to achieve high rate of the post-polymerisation (see Column 10, line 40).

Therefore, it would have been obvious to a person of ordinary skills in the art to use prepolymer with carboxyl acid group content below than 30% in order to achieve high rate of the polymerization.

Allowable Subject Matter

Claims 114-116 objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

In particular, Kerpes or Coover does not teach multiple reactors in series.

(10) Response to Argument

Appellant submits that Coover uses the rotary reactor in order to prevent powder buid-up in the polymerization reactor. In the contrary, Kerpes discloses a polymerization of the granules (pellets). Appellant further submits thta "Clearly, one of ordinary skill in the art would not ignore that the discussion of reactor design relates to powder buildup and not the treatment of granules, which are not powders and require different processing conditions as evidenced by the Reinhardt and Callander declarations of record".

Examiner disagrees. Although Kerpes does not disclose the size of his granules (pellets), the standard equipment (Parr Pellet Press, see Duh, column 8, line 45) produces pellets of 1/8 inch (0.3 mm) of diameter and 3/16 inch (0.5 mm) in length. On the other hand, Coover teaches particle size of 40-70 mesh (0.21-0.42 mm), (see Example 1A and Column 4, line 50). Thus, the size of the standard pellets is comparable with the particle size of the Coover's particles. In addition, it is clear that Coover's design produces better mass transfer, compare to the regular one. In particular, it provides better and more uniform contact of all particles with drying gas,

producing. By using of such a rotating tube apparatus the particles of the polymer with substantially uniform intrinsic viscosity and relatively narrow molecular weight distribution is formed (see Coover, Column 5, line 25).

In his Declaration dated 4/2/2010, Mr. Rinehart compares reactor design of Rinehart (US 4876326) with ones of Coover and Barkey (US 3497477). However, Rinehart and Barkey references not cited in the Final Rejection dated 9/03/2009.

Therefore, Declaration above is irrelevant to the subject matted of the present discussion.

In his Declaration dated 4/2/2010, Dr. Callander states that Kerpes's and Coover's processes are nor combinable, because during the Kerpes's SSP process , IV increases only slightly, whereas Coover's method designs for high IV lift (at least 0.3 units). Therefore, particle size in the above processes should be different. Dr. Callander concludes that modification with Coover may destroy Kerpes's process.

However, Examiner uses Coover for the purposes of the reactor modification. It is clear that Coover's design produces better mass transfer, compare to the regular one. In particular, it provides better and more uniform contact of all particles with drying gas.

Regarding reactor design, Coover teaches that the tube can be designed so that the particles of prepolymer can remain in the reactor for the required period of time, while the tube is being rotated and moving the particles downwardly according to the

degree of slope of the tube. By using of such a rotating tube apparatus the particles of the polymer with substantially uniform intrinsic viscosity and relatively narrow molecular weight distribution is formed (see Column 5, line 25).

In addition, Duh discloses the SSP process with particle sizes comparable to Coover and IV values within the range of Kerpes (see Tables 1 and 2).

Dr. Callander further submits that Coover et al teaches that particles larger than a 20 mesh screen (840 micron or 0.840 mm) "tend to introduce discoloration and slow down the rate of molecular weight build up".

However, the purpose of Kerpes's process is only slight IV lift. In addition, Kerpes's granules are colorless (see Column 1, line 34), which is equal to discolored ones.

Dr. Callander presents does not present any factual evidences in his Declaration.

An affidavit or declaration under 37 CFR 1.132 must compare the claimed subject matter with the closest prior art to be effective to rebut a *prima facie* case of obviousness. *In re Burckel*, 592 F.2d 1175, 201 USPQ 67 (CCPA 1979) (see PMEP 716.02(e).

Appellant submits that the Examiners does not support his statement that Coover's design is beneficial in aldehydes removal.

However, Coover teaches that the tube can be designed so that the particles of prepolymer can remain in the reactor for the required period of time, while the tube is being rotated and moving the particles downwardly according to the degree of slope of

the tube. By using of such a rotating tube apparatus the particles of the polymer with substantially uniform intrinsic viscosity and relatively narrow molecular weight distribution is formed (see Column 5, line 25).

In other words, Coover's reactor allows more uniform heat distribution and drying gas contact with all particles. Uniform IV in Coover's process means that water vapors, which are the product of polycondensation removed uniformly from all particles. Thus, the assumption is made that any vapors, including Aldehydes are also removes evenly from all polyester particles. In addition, uniform IV, which clearly disclosed by Coover is sufficient motivation itself for using Coover's reactor.

Regarding claim 106, Appellant states that high IV lift of at least 0.35 dl/g is not achievable in conventional static bed reactor.

However, Coover teaches horizontal rotating tilted reactor, where IV lift of at least 0.4 dl/g is achieved (see column 5, line 35).

Regarding Claim 112, Applicant submits that the claim specifies 0.1 to 12 degree of the slope and the rotation speed of 0.1-10 rpm.

However, slope of 0.1 Degree practically means horizontal reactor, since this angle is within the measurement error. The claimed range of rotational speed is normally used in commercial reactors.

Issue II

Appellant does not present any arguments regarding Tung.

Issue III

Regarding Duh, Appellant states that "Duh does not, as stated in the Final Rejection, teach that those shapes are advantageous since the formation of undesirable very high molecular weight fraction is reduced. Duh does states that the use of granules is advantageous in that the handling of high molecular weight ultra-high viscosity molten polymers is eliminated".

Examiner disagrees. In Duh's process the particles with weight ultra-high viscosity are not formed and because of that the handling of high molecular weight ultra-high viscosity molten polymers is eliminated.

It is quite clear that the uniform particles provides equal heat exchange without local overheating, leading to formation of the particles with high molecular weight.

Applicant further submits that " "Because Coover discloses a horizontally oriented rotating reactor, shear force will be exerted on any relatively large granules in the shape of pellets, chips, cubes or spheres placed therein and cause the creation of undesirable fines. In fact, any pellets, spheres, chips or cubes placed therein will be reduced to powders, thus making a step of creating pellets, spheres, chips or cubes worthless".

Examiner disagrees. In other words, Appellant states that shear force in Coover's reactor will be so high, that it inevitable produces fines. However, Coover does not

teach any change of the particle size in his reactor during the process. In the contrary, he discloses uniform molecular weight and MWD, which is only possible if the heat and mass exchange is uniform for all particles(i.e. no fines observed).

Issue IV

Appellant does not have any arguments regarding Scannapieco.

Appellant again argues that use of rotating bed reactor can produce fines, which leads to ultra-high molecular weight polymer.

However, Coover teaches uniform molecular weight polymer and narrow MWD, which excludes formation of such polymer.

Appellant submits that Coover's process produces polymer of uniform molecular characteristics due to the nature of the powder. Pellets can produce fines due to the high shear rate.

However, it is not clear, why fines formed in the pellets and not formed in the Coover's particles. Besides, artisans are fully aware of this problem. Thus, the right rotation speed range should be experimentally established. For instance, at 0.1 rpm the shear rate is miniscule. It is substantially higher at 10 rpm, but mass and heat exchange is much better providing higher productivity. Balance between productivity and polymer quality can be determined during routine experimentation.

Appellant submits that Coover radically change the reactor design.

However, Appellant refers to Rinehart's design, which is not cited in the Rejection. Kerpes does not disclose any reactor design, which allows an artisan to use any reactor, including Coover's one.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

GL

/GREGORY LISTVOYB/

Examiner, Art Unit 1796

Conferees:

/James J. Seidleck/

Supervisory Patent Examiner, Art Unit 1796

/Christine Tierney/

Supervisory Patent Examiner, Art Unit 1700